EYEPIECE TO INSTRUMENT COUPLER

Invented by -
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A Small Enity/ Sole Inventor Claim

I claim benefits from prior Provisional Patent
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BACKGROUND OF THE INVENTION

1. Field of the Invention

You have a telescope and then buy an inexpensive modern miracle called a digital camera. Now you would like to keep a record of what you see in the telescope but the fixed lens on that new camera does not give nearly enough magnification. There is a common inclination to push the lens of the camera up to the eyepiece of the telescope. The image shakes and blurs because you cannot hold the camera still nor in perfect optical alignment. Your camera is not one of those real expensive ones and the non-removable lens also has no filter thread and most don't so you cannot connect the lens to the telescope. Ideally you need a coupler that will allow you to securely connect and hold your camera in optical alignment with the eyepiece of the telescope. This invention is intended to completely answers those requirements without any other adapters or specialized fittings.

2. Description of the Prior Art

There has long been a need for an adapter that can couple a viewing instrument to a camera or other form of recording instrument. Flexibility meant lower cost and less instrumentation which in turn meant less equipment to carry into the field. Hopefully it was more economical on the bank account as well.

An adapter was patented by Beecher (2765718) in 1956 that would couple a camera to a binocular. Utility of that adapter differs from mine in that the camera lens was removed as well as the eyepiece shroud and rubber lens cap and the adapter used was machined to fit the precise threads exposed from the removal of the shroud. If the threads were a different size or pitch, the adapter would not work, mine does. If the camera lens were not removable the adapter would not work, mine does. My invention will also work on other forms of scopes and eyepiece that have fixed shrouds and rubber eyecups were as this adapter will not.

As early as the 1960s there have been body to body mounts for telescopes and there are still some around today but their utility is both different and limited. The body to body mount attaches to the telescope usually in a semi-permanent way and then holds a camera over the eyepiece of the scope. It is not interchangeable with other types of scopes and often with other sizes of scopes, my invention does. Because of longer coupling lengths these body to body mounts tend to be wobbly and cannot move with the eyepiece into focus but must be positioned separately. My invention being short coupled is very steady and by attaching to the eyepiece, is focused in a single action with said eyepiece.

An adapter was patented by Feinbloom (4143938) in 1979 that would couple a camera to a microscope. Utility of that adapter differs from mine in that the adapter is so specialized that it will work only with a microscope with specific modifications. In a heavy duty industrial sort of way that would be better but my invention will allow virtually any camera to adapt to virtually any scope without modification to that scope. With my invention the scope and camera can be separated and each used for other purposes.

An adapter was patented by Tawara, a Japanese Inventor, (4318395) in 1982, with a prior Japan patent (54-69289), that would couple a camera to an endoscope. Utility of that adapter differs from mine in that the adapter is specifically designed for an endoscope ocular or eyepiece and requires the unique conical shaped barrel of such eyepiece to clamp onto. There is also no provision for a wide range of cameras with and without removable lenses and filter rings. My invention resolves all these issues and will work on other scopes as well.

Patents (4723864), (4740058), (4807594), (4844071) each dwell on the unique shape of the endoscope ocular and again vary from and lack the universal nature and utility of my Invention.

An adapter was patented by Centkowski, Manios and Weaver (4862199) in 1989 that would couple a camera to a borescope. Utility of that adapter differs from mine in that it requires the removal of both the eyepiece and camera lens. If either the camera lens or the eyepiece cannot be removed their adapter will not work but mine will.

An adapter was patented by Benz (5053794) in 1991 that claims to be a "Universal Adapter." In the form presented, the adapter will not connect to any camera and to do so actually requires special and specific adapters. What the adapter actually is is a version of ring clamp that will only clamp on to the outside of an eyepiece head. If the eyepiece head is not wide enough, has a projecting flange, has a rubber eye cup or is tapered, this adapter will not work but my invention will work in each and all cases. Utility of that adapter also differs in that it will not clamp onto the lower barrel of the eyepiece below the head so in the case of the aforementioned eyepieces, the adapter cannot be used at all but my coupler will. The adapter will not fit onto square shrouds such as but not limited to an Otto-scope but my invention will. Furthermore the adapter does not address the connection to a camera that does not have a removable lens or a lens with filter ring threads but my Invention does.

Most recently and a long time after my initial filing I saw an adapter on E-Bay. That adapter used a insert that replaces the eyepiece in the focuser and then the eyepiece is replaced into the top end of the insert. From the insert is a slip post and base bracket. The utility of this adapter differs from mine in that it displaces the eyepiece from focus by more than the barrel length of the eyepiece which is often too much. In many cases the scope cannot come to focus. A slip post does not allow one to move the camera aside and return it with any degree of accuracy. My coupler can be precisely repositioned. The adapter also will not work with binoculars or other scopes with non-removable eyepieces, my invention does.

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SUMMARY OF THE INVENTION

In simple terms, this invention was designed to readily couple a scope of any form to a camera of any form. This Invention is designed to attach to the eyepiece or eyepiece shroud of any generic telescope, microscope, binocular. spotting scope, endoscope, borescope etc. with or without removeable eyepieces and couple said scope to a camera or other imaging device with or without removeable lenses, and with fixed, non-removable lenses that also do not have threads for filter rings. It is by design that the Invention can be used on more than one type or size scope with more than one type or size camera without additional adapters.

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BRIEF DESCRIPTION OF THE DRAWINGS
(6- Drawings on 3- sheets)

Fig. 1, is a perspective view depicting all the components of the Invention, including the Clamping Device that attaches invention to an eyepiece and Tripod Socket Screw that attaches an Imaging instrument such as but not limited to a camera.

Fig. 2, is a side view with cut-aways to provide cross sectional views of Invention as it would typically be used to connect Eyepiece to a Camera type Instrument by what is commonly know as the Afocal method of imaging.

Fig. 3, is a side view with cut-aways to provide cross sectional views of Invention as it would typically be used to connect Eyepiece to a Camera type Instrument by what is commonly know as the Eyepiece Projection method of imaging with the Camera Lens removed.

Fig. 4, is a side view with cut-aways to provide cross sectional views of Invention as it would typically be used to connect Eyepiece to a Camera type Instrument by what is commonly know as the Prime Focus method of imaging with the Eyepiece lens elements and the Camera Lens removed.

Fig. 5, is a side view with cut-aways to provide cross sectional views of Invention as it would typically be used to connect Eyepiece to a Camera type Instrument by clamping onto the head of Eyepiece Lens Barrel, Threads or Lens Shroud typically when the Eyepiece is non-removable.

Fig. 6, is a perspective view depicting all the components of the Invention, including the Clamping Device that is roughly sized and shaped to attach to non-conforming eyepieces and in particular, square eyepiece shrouds as used on but not limited to Otto-scopes.

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DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to **Fig. 1**, the Invention may be seen in one form offered as Invention's simplest, most common and preferred embodiment. The preferred embodiment is not the only form to accomplish the function and utility of this Invention. A prototype of invention was made using aluminum tubing sawed to shape C1 and machined by lathe to size **C2**, drilled and tapped to accommodate common "no-mar" hex head Allen screws **C3, C4** and "all thread" zinc plated steel Post **P1**. Aluminum flat stock was sawed to length **B1**, drilled and tapped on one end for Post **P1** and a slot **B2** milled with one end tapped **B3** to accommodate a common Tripod Socket Screw **T1**. A common thumb nut **P2** is used on Post **P1**. Utility of Invention is not limited to sizes or materials used in prototype.

Referring to **Fig. 1**, the Invention consists of a Clamping Device **C1** and in Invention's preferred embodiment has an inner cylindrical surface **C2** sized to slide over Eyepiece Barrel **E3** and fixed in position by means of a clamping pressure exerted by Thumb Screws **C3**, **C4**, which are threaded through holes drilled and tapped into Clamping Device **C1**. Another hole is drilled and tapped into external cylindrical surface of Clamping Device **C1** to accommodate attachment by a threaded Post **P1**.

Referring to **Fig. 1**, the Invention also consists of a Post **P1** that in Invention's preferred embodiment, has external threads on Post's **P1** entire length. Post **P1** is securely threaded into a drilled and tapped hole in Clamping Device **C1**. Post **P1** also freely threads through a drilled and tapped hole in Base Bracket **B1** to provide an adjustable but certain distance between Clamping Device **C1** and Base Bracket **B1**. Orientation of Clamping Device **C1** with regards to distance from and axial alignment with Base Bracket **B1** is secured by Post Locking Nut **P2** which is threaded on Post **P1** and is tightened against Base Bracket **B1**.

Referring to **Fig. 1**, the Invention in the form of preferred embodiment, has a Base Bracket **B1** that is drilled through and tapped near one end to accommodate Post **P1**. Base Bracket **B1** has a slot **B2** milled in to it starting near the hole for Post **P1** and continuing for most of said bracket's length. There is an area **B3** of slot **B2** that is tapped to accommodate Tripod Socket Screw **T1**. After the Tripod Socket Screw **T1** is fully threaded into Base Bracket **B1**, it is free to slide the length of slot **B2** and engage the Tripod Socket **I2** of Instrument **I1-I3**.

Referring to **Fig. 1**, the Invention in the form of preferred embodiment, also has a Tripod Socket Screw **T1** that has an undercut between the screw head and threaded end that is equal to the thickness of Base Bracket **B1**. Once fully threaded into Base Bracket **B1** at area **B3**, said undercut allows Socket Screw **T1** to freely turn and slide the entire length of slot **B2**. At this point Socket Screw **T1** is free to thread into Instrument's Tripod Socket **I2** and thereby secure Instrument **I1-I3** to Base Bracket **B1**.

Referring to **Fig. 1** & **Fig. 2**, the Invention in the form of preferred embodiment, has a reference line **OA** running through and co-axially aligned with the Clamping Device **C1**. Post **P1** with Clamping Device **C1** and thereby the Optical Axis **OA**, rotate in a plane parallel to Base Bracket **B1**. The combination of movements consisting of Base Bracket **B1** around Post **P1**, Base Bracket **B1** up and down Post **P1**, Tripod Socket Screw **T1** forward and back in slot **B2** and finally Instrument **I1-I3** around the axis of Tripod Socket Screw **T1**, provide for a complete alignment between and coupling of Eyepiece **E1-E3** to Instrument **I1-I3**.

Referring to **Fig. 1** & **Fig. 2**, in nearly forty years of making and using scopes and instruments, I have yet to find a coupler that works so well and independent of the characteristics of eyepiece, with or with out fixed lenses of which may or may not have lens rings. The Clamping Device **C1** may fit on the Eyepiece Barrel **E1** as seen in the preferred embodiment but it may also fit on the Eyepiece Head **E3** or even on some Focuser Draw Tubes **F3**. These methods of attachment allow for removal and insertion of Eyepiece **E1-E3** and Instrument **I1-I3** as a Unit and to be focused simultaneously, Body to body mounts do not provide for precise optical alignment, and tend to be unstable nor do they allow for focusing eyepiece and instrument as a unit.

Referring to **Fig. 2**, the Invention in the form of preferred embodiment, can be seen in typical use with Clamping Device **C1** attached around and supported in position by Eyepiece Barrel **E1,** which is in turn supported by the draw tube **F3** of Focuser **F1-F5** as part of a Scope in generic form. With support derived from Eyepiece **E1-E3,** Clamping Device **C1** conducts said support to Post **P1** which in turn supports Base Bracket **B1** at an adjustable distance from Optical Axis **OA** passing through the concentric axis of Eyepiece **E1-E3** and Clamping Device **C1**. Base Bracket **B1** continues this support to Tripod Socket Screw **T1** that slides toward or from Post **P1**. Tripod Socket Screw **T1** attaches Invention to the body of Instrument **I1-I3** by threading into Instrument's Tripod Socket **I2**. In the absence of a Tripod Socket **I2**, another bracket with clamping, holding or other fixturing to support the Instrument **I1-I3**, can be attached to Tripod Socket Screw **T1** or Base Bracket **B1**.

Referring to **Fig. 2**, the distance from Base Bracket **B1** to Clamping Device **C1** and therefore the Optical Axis **OA** is determined by how far up or down Base Bracket **B1** is positioned on Post **P1**. Said position is adjusted to match the distance from radial center of Eyepiece **E1-E3** to Base Bracket **B1,** with the corresponding distance from radial center of the Instrument Lens **I3** to Base Bracket **B1**. When said distance are matched, Base Bracket B1 can be turned slightly upon Post **P1** and Instrument **I1-I3** can be twisted upon and slid forward or back upon Base Bracket **B1** so positioning and alignment between Eyepiece **E1-E3** and Instrument Lens **I-3** may be determined. When said positions are determined, they may be secured by tightening Post's Locking Nut **P2** and Tripod Socket Screw **T1**.

Referring to **Fig. 2**, when the alignment of Eyepiece **E1-E3** with Instrument **I1-I3** is complete, the remaining portion of Eyepiece Barrel **E1** maybe inserted into Scope's Focuser's Draw Tube **F3** (or similar) and secured by tightening Focuser's Thumb Screw **F5**. When properly aligned, the Optical Axis **OA** will be a straight line through Scope in generic form, Scope's Focuser **F1-F5**, Eyepiece **E1-E3** in typical form, Invention in preferred embodiment and Instrument **I1-I3** in generic form.

Referring to **Fig. 2**, the Invention in the form of preferred embodiment depicts use by the Afocal method. If Instrument Lens **I3** is removable, doing so will facilitate use in the Eyepiece Projection method. Additional removal of Eyepiece Optics Section **E3** will facilitate use in the Prime Focus method.

Referring to **Fig. 3**, the Invention in the form of preferred embodiment, can be seen as might be used by the Eyepiece Projection Method with the Instrument's Lens **I3** removed. In this configuration, an Image is projected from the Eyepiece **E1-E3** along the Optical Axis **OA** onto the film plane or imaging sensor within the Instrument body **I1.**

Referring to **Fig. 4**, the Invention in the form of preferred embodiment, can be seen as might be used by the Prime Focus Method with both the Instrument's Lens **I3** and the lens portion of the Eyepiece **E3** removed. In this configuration, an Image is projected through the Eyepiece Barrel **E1** along the Optical Axis **OA** onto the film plane or imaging sensor within the Instrument body **I1.**

Referring to **Fig. 5**, the Invention in the form of preferred embodiment, depicts the utility of the Invention to attach to fixed, non-removable eyepieces. Said attachment occurring on smooth, grooved or threaded Eyepiece Heads **E3**. As can be seen in **Fig. 5**, Invention's Clamping Device **C1**, engages and clamps onto the outer portion of the Eyepiece, the Eyepiece Head **E3**.

Referring to **Fig. 6**, the Invention in another form of embodiment, depicts the Invention adapted to attach to non-standard, odd sized and odd shaped eyepieces and eyepiece shrouds. The Invention as depicted in **Fig. 6**, is particularly optimized but not limited to the attachment to square eyepiece shrouds as found in medical Otto-scopes. In this embodiment, the Invention's Clamping Device **C1**, as depicted in **Fig. 1**, has been replaced with alternate Clamping Device **C1a** in **Fig. 6**. **C1a** is simply a square version of the round **C1**.